



Europäisches Patentamt
European Patent Office
Office européen des brevets

Publication number:

0 180 389
A2

EUROPEAN PATENT APPLICATION

Application number: 85307563.8

Int. Cl.⁴: **F 16 D 69/00**

Date of filing: 18.10.85

Priority: 26.10.84 AU 7853/84

Applicant: **REPCO LIMITED**, 630, St. Kilda Road,
Melbourne Victoria 3004 (AU)

Date of publication of application: 07.05.86
Bulletin 86/19

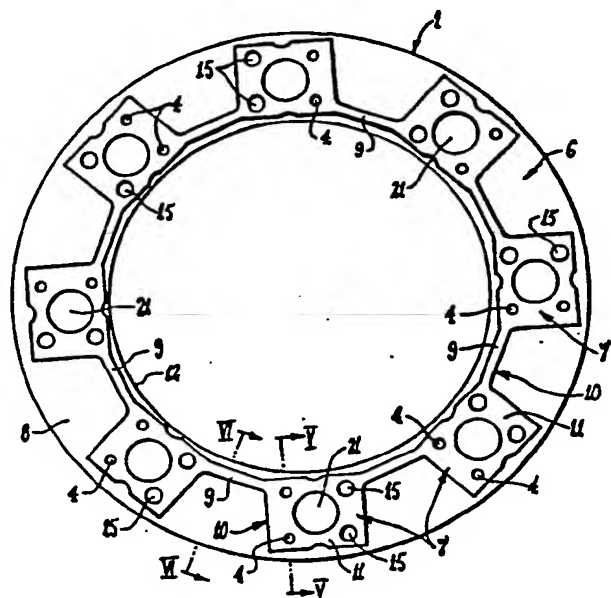
Inventor: **Hadaway, Bernard M.**, 10 Highland Avenue,
Highett Victoria, 3190 (AU)

Designated Contracting States: **DE FR GB IT**

Representative: **Jennings, Guy Kenneth, GILL**
JENNINGS & EVERY 53-64 Chancery Lane, London
WC2A 1HN (GB)

Friction components for clutch plates and the like.

A friction component (1) for a clutch or brake including a facing (6) of friction material and at least one metal section (7) of plate-like form embedded in a rear surface (8) of that facing (6) and having an integral rivet (4) or other fastener projecting outwardly from the facing rear surface (8). The metal section (7) extends across a relatively small part of the facing rear surface (8) and if there is a plurality of such sections (7) they may be interconnected through integral bands (9). In the case of an annular friction component the metal sections (7) are spaced circumferentially around the friction facing (6) and the connecting bands (9) are preferably adjacent the inner periphery (12) of the facing (6).



ACTORUM AG

EP 0 180 389 A2

FRICTION COMPONENTS FOR CLUTCH PLATES AND THE LIKE

This invention is concerned with friction components as used in brakes and clutches. The invention has particular application to clutch plates such as those used in the drive transmission systems of motor vehicles, and it will be convenient to hereinafter describe the invention with particular reference to such vehicle clutch plates. It is to be understood, however, that the invention is applicable to clutch plates intended for other uses, and is also applicable to brakes of various kinds.

10 A typical vehicle clutch plate includes a central inner section which carries a splined hub by which a drive connection is made with a vehicle tail shaft, and an annular outer section which is connected to and rotates with the inner section. The outer section has friction facing on each of two opposite sides and is clamped between a pressure plate and a flywheel, for example, when the clutch is engaged to transmit drive from the flywheel to the gear-box and tail shaft. It is usual to form each of the aforementioned sections of two plate-like parts which are connected together in face to face relationship. The splined hub and inner section are usually interconnected through torsional damping springs in a manner such that the hub and inner section are capable of limited rotation relative to one another.

25 The friction component for such a clutch plate is generally of annular form and is secured in place by means of separately formed rivets which are counter-sunk below the surface of the facing. It follows that the only usable part of the facing is that part which exists above the heads of the counter-sunk rivets.

30 One problem with such prior constructions is that the usable part of the friction facing is limited by the intrusion of the rivets into the facing. Another problem is that setting of the several individual rivets is an inconvenient and time consuming task.

35 It is an object of the present invention to provide an improved friction component, and particularly such a component which is convenient to assemble with other components. It is another object of the invention to provide a friction

component having fastening means secured to a rear surface thereof in such a way as to require minimum intrusion into the body of the friction facing. It is a further object of the invention in a particular form to provide an improved clutch plate including such a friction component.

The invention will be hereinafter described with reference to a clutch plate of the general form described above in which each of the clutch plate sections is formed of two parts. Furthermore, the inner and outer sections may be secured together by means of rivets formed in accordance with the method described in co-pending European

application no: 85307297.3 and the disclosure of the specification of that application is to be read into the present specification by cross-reference. Each part of the annular outer section of the clutch plate will be hereinafter called a friction component and the part of the inner section which carries the cushion segments will be called the main plate.

In accordance with the present invention there is provided a friction component including, a facing of friction material and at least one plate-like section embedded in and secured to a rear surface of said facing, said section having formed thereon at least one integral fastener which projects outwardly therefrom away from said rear surface.

It is preferred that the plate-like section is made of sheet metal, but a non-metallic material such as sufficiently strong plastics material could be satisfactory. When applied to clutch plates the friction component will usually be of annular form. In particular, the friction facing will be in the form of an annular section and there will be a plurality of metal sections embedded in the rear surface of that friction facing in circumferentially spaced relationship. Preferably, adjacent metal sections are interconnected through narrow integral bands of metal, each of which is located adjacent the inner periphery of the annulus. It is further preferred that each of those bands is substantially straight so as to extend generally in the direction of a tangent to that inner periphery rather than following the curvature of the inner periphery.

The essential features of the invention, and further optional features, are described in detail in the following passages of the specification which refer to the accompanying drawings. The drawings however, are merely illustrative of how the invention might be put into effect, so that the specific form and arrangement of the features (whether they be essential or optional features) is not to be understood as limiting on the invention.

In the drawings:

10 Figure 1 is an elevational view of a typical form of clutch plate to which an embodiment of the invention is applicable, in which parts have been removed for convenience of illustration;

Figure 2 is a view taken along line II-II of figure 1,

15 Figure 3 is a cross sectional view taken along line III-III of figure 1;

Figure 4 is an elevational view of an example friction component according to one embodiment of the invention;

Figure 5 is an enlarged cross sectional view taken along 20 line V-V of figure 4;

Figure 6 is an enlarged cross sectional view taken along line VI-VI of figure 4;

Figure 7 is a diagrammatic view of one form of method for producing part of a friction component in accordance with the 25 present invention;

Figure 8 is a view of the friction component part as manufactured in accordance with the method of figure 7;

Figure 9 is an enlarged cross sectional view taken along line IX-IX of figure 8;

30 Figure 10 is an enlarged cross sectional view taken along line X-X of figure 8;

Figure 11 is a partial view of another form of friction component made in accordance with the present invention;

Figure 12 is a view similar to figure 11 but showing yet 35 another embodiment;

Figure 13 is a view similar to figure 11 but showing still another embodiment, and

Figure 14 is a view of yet another embodiment.

A typical clutch plate to which the invention is

applicable is shown in part in figure 1, and in that construction each friction component 1 is connected to the main plate 2 through a plurality of separate cushion segments 3 which are plate-like and are formed of spring steel or the like. Each segment 3 is formed so as to function as a resilient spacer, whereby the two annular friction components 1 are supported in axially spaced relationship as shown in figure 2, but can be moved towards one another as a consequence of flexing of the segments 3. The cushion segments 3 are of known form and consequently need not be described in further detail.

In the particular arrangement shown, each cushion segment 3 is secured to each of the two friction components 1 by means of rivets 4 (figure 2). For that purpose, each friction component 1 may be provided with a series of integral rivets 4 and those rivets 4 may be formed in the manner described in co-pending application 85307297.3 or they may be formed in any other appropriate manner. Furthermore, the rivets 4 may be provided in a single row as shown in figure 1, or there may be two or more rows of such rivets 4.

Integral rivets 5, preferably of the foregoing kind, may be also formed on the main plate 2 of the clutch plate assembly and those rivets 5 can be arranged in spaced relationship around a pitch circle which is concentric with the clutch plate axis. As shown in figure 1, the rivets 5 are usually arranged in pairs, and the rivets 5 of each pair are spaced circumferentially around the same pitch circle. The rivets 5 of each pair are used to secure a respective cushion segment 3 to the main plate 2.

Any suitable method may be adopted to set the rivets 4 and 5 and thereby secure the various components in assembly.

In the construction shown, each friction component 1 comprises an annular body 6 of friction facing and a plurality of plate-like sections 7 embedded into a rear surface 8 of that facing body 6. An example form of that type of construction is shown in figures 4 to 6 of the drawings. That and other examples shown by the accompanying drawings are related to clutch plate use, whereas in other applications of the invention the component need not be annular and a single

metal section may be embedded in the facing body rather than having a plurality of such sections as shown.

Each section 7 is preferably formed of sheet metal and is of such a size as to extend across a relatively small part of the surface 8. In that regard the function of each metal section 7 is to provide a carrier for at least one fastener 4, which in the example shown is in the form of a rivet, and in particular provides such a carrier which requires minimum intrusion of either it or the associated fastener 4 into the body 6 of the friction facing. In the example of figures 4 to 6 a plurality of integral rivets 4 is provided on each section 7, but in other situations there may be a single rivet only. Again in the particular example shown, adjacent sections 7 are interconnected by an integral narrow band 9 so that all sections 7 form part of a single unit, which will be hereinafter referred to as a skeleton 10. The skeleton 10 is embedded in the rear surface 8 of the facing body 6 as best shown in figures 5 and 6.

It is significant that the skeleton 10 is embedded within the rear surface 8 of the facing body 6 and in that regard it is preferred that the exposed face 11 of each section 7 is substantially co-planar with the surface 8. That co-planar arrangement allows the cushion segments 3 to engage the rear surface 8 of the facing body 6 outside the perimeter of the section 7 and thereby increase the area of the facing body 6 which can be directly supported by the cushion segments 3 during use. Embedding the skeleton 10 has the further advantage of resisting separation of the skeleton 10 and the facing body 6 under torque loading.

The skeleton 10 can be secured to the facing body 6 in any appropriate fashion. For example, the body 6 may be moulded over the skeleton 10 so that bonding of the body 6 and skeleton 10 is achieved simultaneous with moulding. The skeleton 10 may be pretreated to improve the bond between it and the body 6, whether or not that bond is achieved simultaneous with moulding of the body 6. For example, the skeleton 10 may be subjected to a phosphating process, or it may be provided with an adhesive coating by spraying or other appropriate technique.

As shown in figure 4 the connecting bands 9 are arranged adjacent the inner periphery 12 of the facing body 6. It is preferred that each band 9 is substantially straight so as to extend generally in the direction of a tangent to the periphery 12.

A skeleton 10 of the general kind shown by figure 4 can be formed in any appropriate manner. For example, it may be pressed, stamped, or cut from sheet metal stock. Alternatively, it may be formed from a substantially straight strip of metal which is bent into a circular form as shown in figure 4. Figure 7 shows in diagrammatic form a method of the latter kind. In that method, a straight strip 13 of metal is fed into a press tool 14 which, in the example shown, serves to stamp or press sections from the strip 13 so as to form the sections 7 and interconnecting bands 9. For that purpose, passage through the press tool 14 will be on an intermittent basis. The tool 14 may also serve to form the integral rivets 4 and clearance holes 15 in each section 7.

The resulting formed strip 16 is then introduced into winding and shear mechanism 17 which serves to bend the formed strip 16 into the circular form previously mentioned. When that bending or winding operation has advanced to the stage shown in figure 7, the mechanism 17 operates to separate, by a cutting action for example, the resulting circular or annular skeleton 10 from the remainder of the strip 16. Such separation occurs along the line 18 as shown in figure 7.

Figures 8 to 10 show the skeleton 10 as it is formed by the mechanism 17. If desired, the opposed ends 19 and 20 of that skeleton 10 can be secured against separation by welding or other appropriate means.

In the particular arrangement shown by figures 7 to 10 the tool 14 removes a central portion of each section 7 so as to produce an opening 21 and that serves to reduce the material content and consequently the weight of the resulting skeleton 10.

Obviously, methods other than that described in connection with figure 7 may be adopted to form a skeleton 10 as shown in figures 8 to 10.

Furthermore, the skeleton may take many different forms

and one alternative to the figure 4 arrangement is shown in figure 11. Components of the figure 11 construction which correspond to those of the figure 4 construction are given like reference numerals except that they form part of the number series 100 to 199. As with figure 4, the skeleton 110 is embedded in the facing body 106.

Figures 12 and 13 show arrangements in which the metal sections are formed as individual components rather than being interconnected as in the figure 4 and 11 arrangements. In each case components corresponding to those of figure 4 are given like reference numerals except that they form part of the number series 200 to 299. Figure 14 shows still another arrangement in which components are identified by numbers in the series 300 to 399. In each of the arrangements of figures 12 to 14 the metal sections 207 or 307 are embedded in the facing body 206 or 306 respectively as in the case of the figure 4 arrangement.

It will be apparent that many other variations are possible and that figures 11 to 14 merely illustrate a few of the available alternatives. Furthermore, as previously stated, the examples shown in the drawings relate to clutch plates and other forms of the invention may be more appropriate in other applications of the invention such as friction components for brakes.

A friction component in accordance with the present invention has several important advantages over the prior art. One advantage is that the friction facing can be made thinner than in the case of prior constructions while having the same depth of usable material.. Such a reduction in thickness reduces the cost of the component and also reduces its inertia. When the invention is applied to clutch plates, the latter aspect can reduce wear in associated transmission components. Furthermore, the use of integral rivets adds to the convenience of connecting the friction component into an assembly. It is also possible to accurately locate the or each metal section relative to the friction facing, particularly when that facing is moulded directly over the metal section while that section is located in the moulding die. That improves the balance of the component with

consequent improvement in overall performance.

Other advantages will be apparent from the foregoing detailed description.

Various alterations, modifications and/or additions may
5 be introduced into the constructions and arrangements of parts
previously described without departing from the spirit or
ambit of the invention as defined by the appended claims.

10

15

20

25

30

35

CLAIMS:

1. A friction component including a facing (6) of friction material, characterised in that at least one sheet plate-like section (7) is embedded in and secured to a rear surface (8) of said facing (6), and said section (7) has formed thereon
5 at least one integral fastener (4) which projects outwardly therefrom away from said rear surface (8).
2. A friction component according to claim 1, further characterised in that said section (7) extends across a small part of the area of said rear surface (8).
- 10 3. A friction component according to claim 1 or 2, further characterised in that said facing (6) is an annular section of friction material.
4. A friction component according to any preceding claim, further characterised in that a plurality of said plate-like
15 sections (7) are provided on said facing (6) in spaced relationship.
5. A friction component according to claim 4, further characterised in that adjacent said plate-like sections (7) are interconnected to form a single member (10).
- 20 6. A friction component according to claim 5, further characterised in that said interconnection comprises an integral relatively narrow metal band (9).
7. A friction component according to claim 6 when appended to claim 2, further characterised in that said facing (6) is
25 an annular section of friction material, said plate-like sections (7) are arranged in circumferentially spaced relationship around said annular section, and each said band (9) extends in a substantially straight path between the said adjacent plate-like sections (7) and is located adjacent the
30 inner periphery (12) of said annular section.
8. A friction component according to claim 6, further characterised in that said interconnected plate-like sections (7) are initially formed as a substantially straight series (16) of sections (7) in which said bands (9) extend in the
35 longitudinal direction of the straight series (16) and said plate-like sections (7) project laterally outward from one side of said bands (9), and said straight series (16) is bent to form a substantially annular skeleton (10) in which said

bands (9) form part of the inner periphery.

9. A friction component according to claim 8, further characterised in that each said band (9) of the skeleton (10) is substantially straight.

5 10. A friction component according to claim 8 or 9, further characterised in that said interconnected plate-like sections (7) are manufactured in strip form and said skeleton (10) is separated from said strip (13) after being bent into said annular form.

10 11. A friction component according to any preceding claim, further characterised in that the or each said facing (6) is formed by moulding and said plate-like section (7) is secured to said facing (6) by being bonded thereto simultaneous with the moulding step.

15 12. A friction component according to any preceding claim, further characterised in that the or each said plate-like section (7) is formed of sheet metal.

20 13. A friction component according to claim 12, further characterised in that the or each said metal section (7) is subjected to phosphating before being embedded in and secured to said facing (6).

14. A friction component according to any preceding claim, further characterised in that the or each said plate-like section (7) is secured to said facing (6) by adhesive.

25 15. A friction component according to any preceding claim, further characterised in that the or each said fastener (4) is a rivet-type fastener and is hollow.

30 16. A friction component according to any preceding claim, further characterised in that the face (11) of the or each said plate-like section (7) which is exposed at the rear surface (8) of said facing (6) is substantially coplanar with said rear surface (8).

35 17. A clutch plate assembly characterised in that it includes a friction component (1) according to claim 3, or any claim appended thereto.

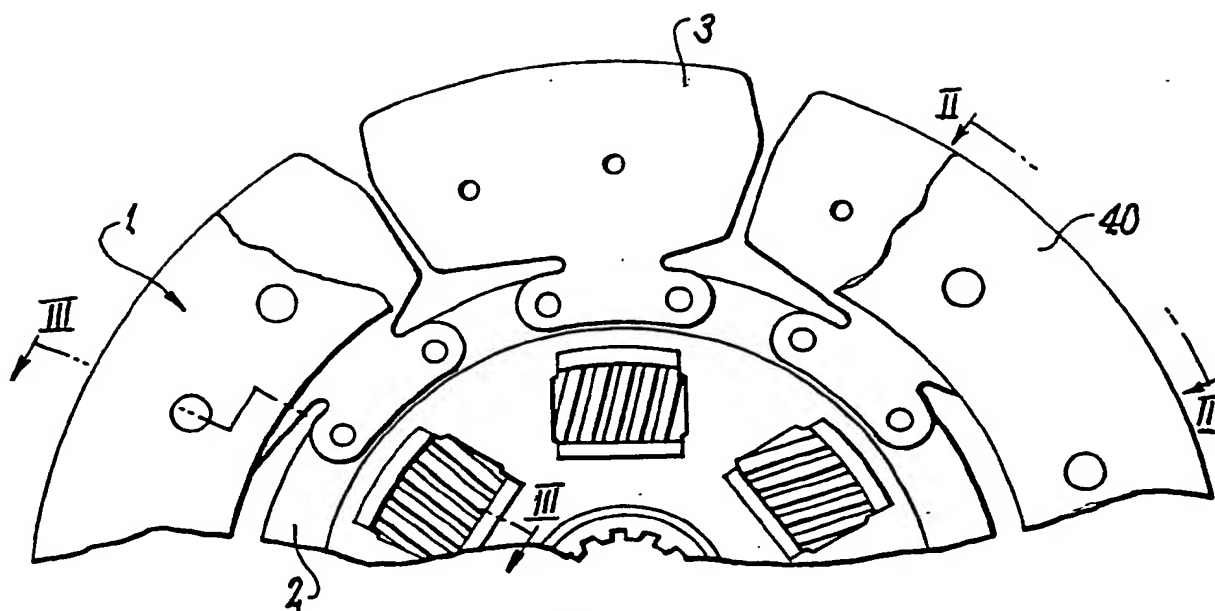


FIG 1

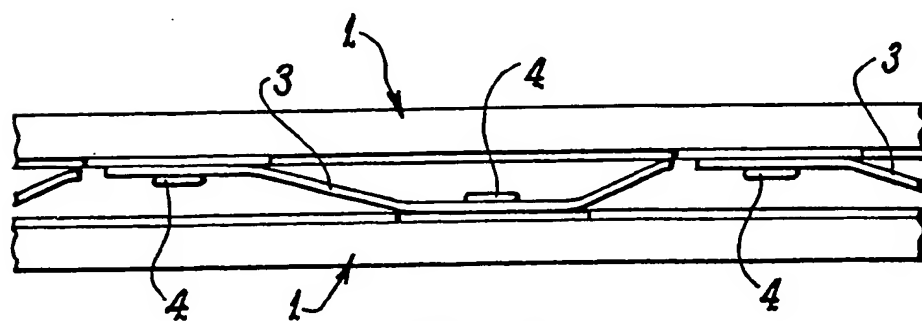
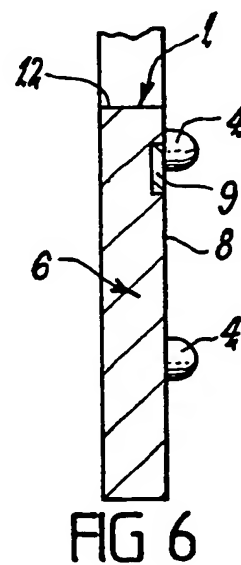
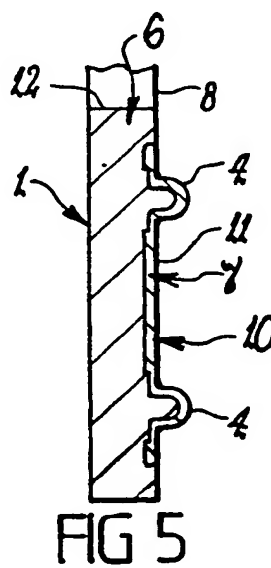
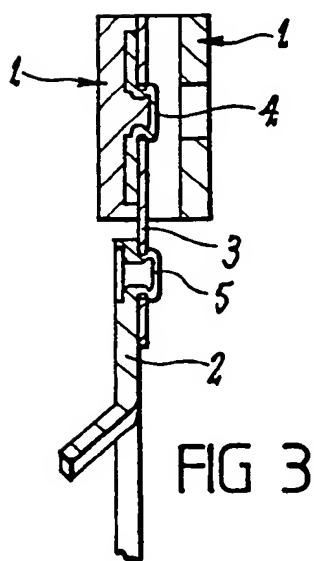
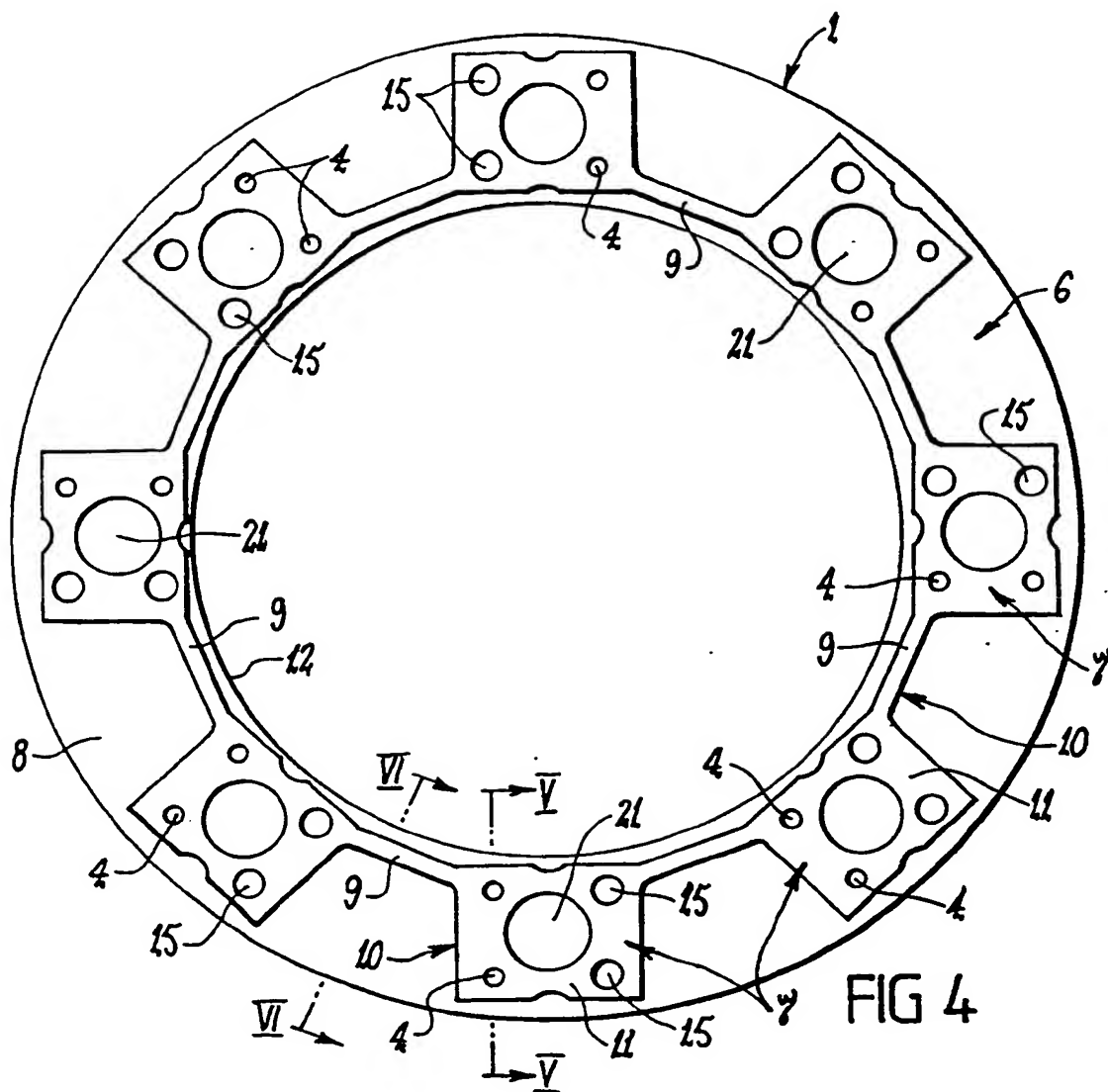


FIG 2



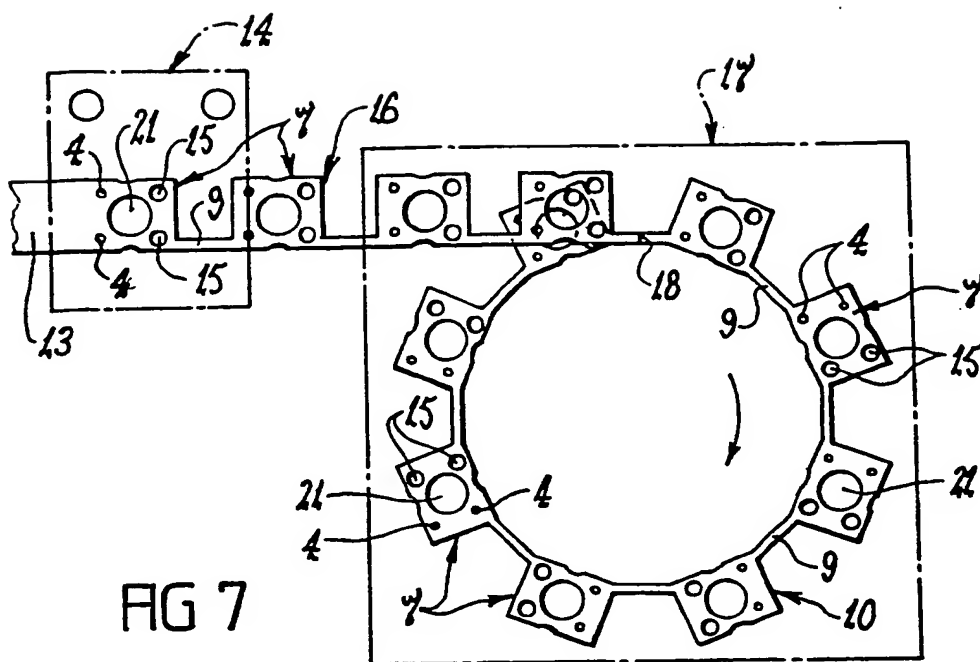


FIG 7

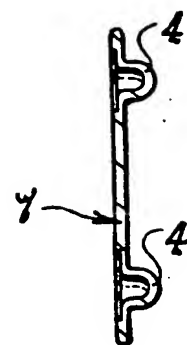


FIG 9

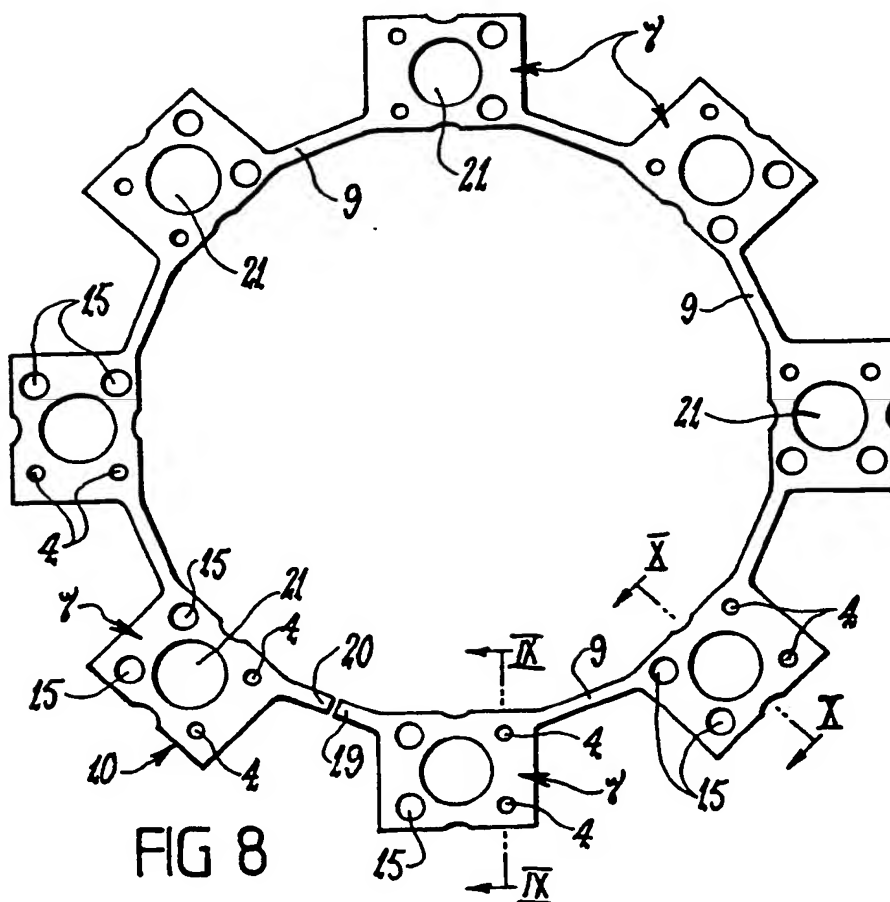


FIG 8

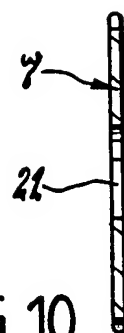
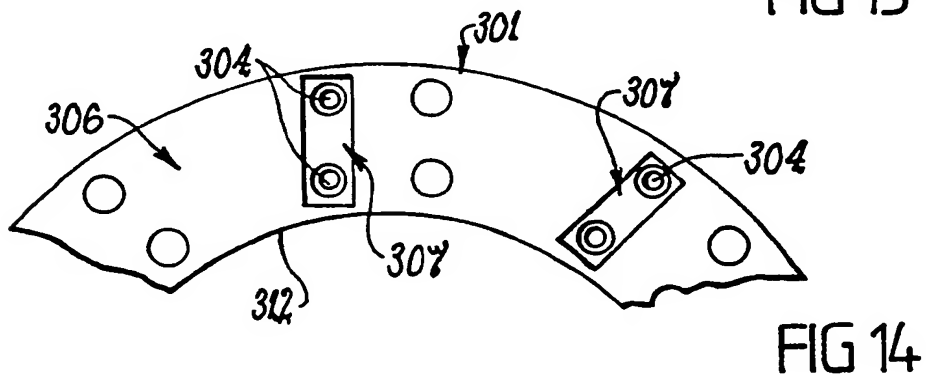
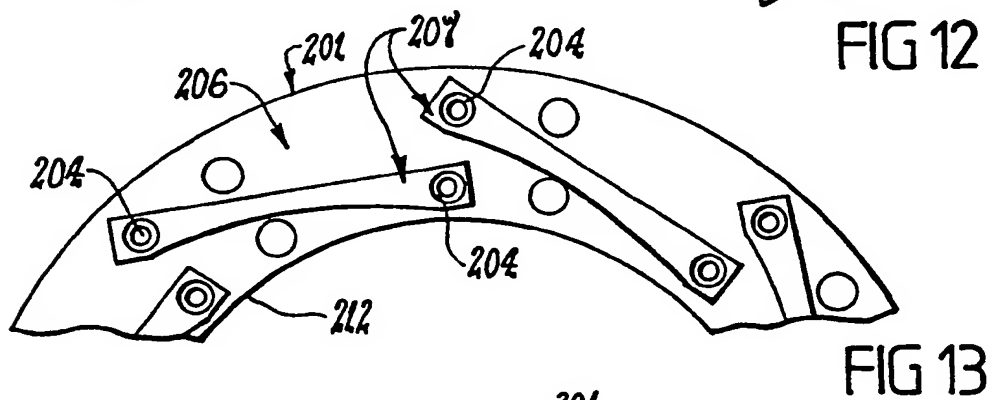
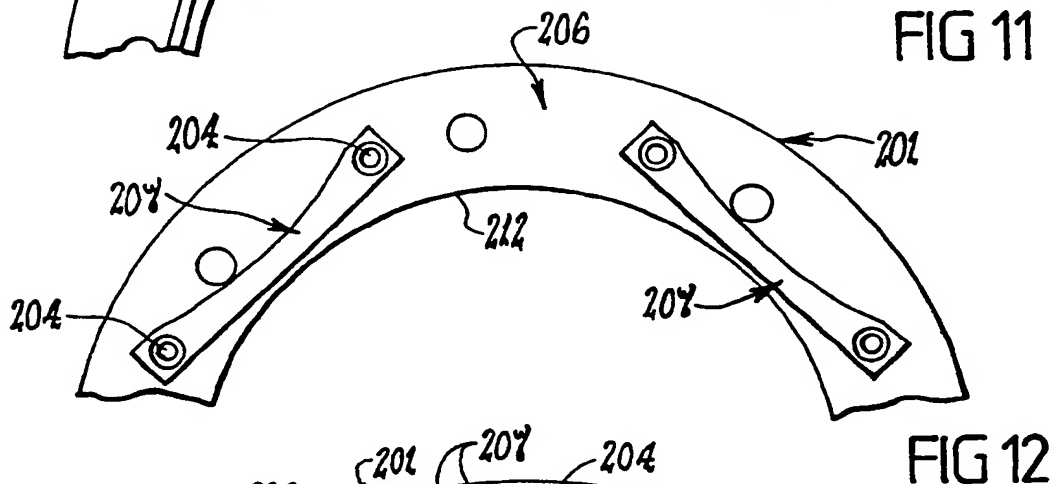
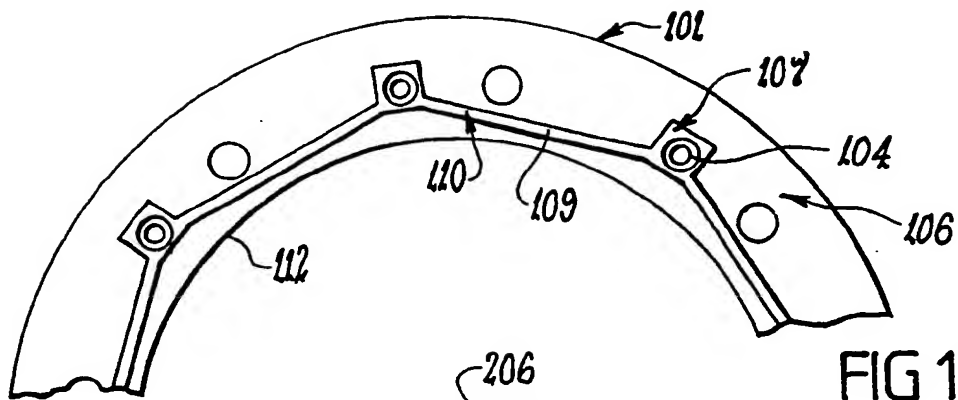


FIG 10



-3- BASIC DOC - 3



Office européen des brevets

(11) Publication number:

0 180 389

A3

EUROPEAN PATENT APPLICATION

(12)

(51) Int. Cl.⁴: F 16 D 69/00

(21) Application number: 85307563.8

(22) Date of filing: 18.10.85

(30) Priority: 26.10.84 AU 7853/84

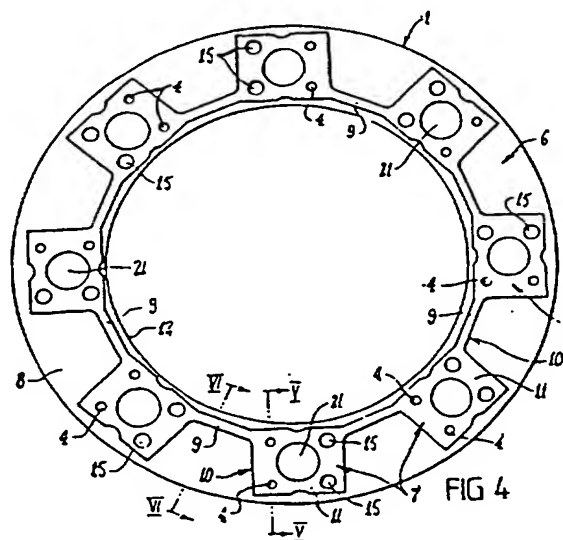
(43) Date of publication of application:
07.05.86 Bulletin 86/19

(88) Date of deferred publication of search report: 22.04.87

(84) Designated Contracting States:
DE FR GB IT(71) Applicant: REPCO LIMITED
630, St. Kilda Road
Melbourne Victoria 3004(AU)(72) Inventor: Hadaway, Bernard M.
10 Highland Avenue
Highett Victoria, 3190(AU)(74) Representative: Jennings, Guy Kenneth
GILL JENNINGS & EVERY 53-64 Chancery Lane
London WC2A 1HN(GB)

(54) Friction components for clutch plates and the like.

(57) A friction component (1) for a clutch or brake including a facing (6) of friction material and at least one metal section (7) of plate-like form embedded in a rear surface (8) of that facing (6) and having an integral rivet (4) or other fastener projecting outwardly from the facing rear surface (8). The metal section (7) extends across a relatively small part of the facing rear surface (8) and if there is a plurality of such sections (7) they may be interconnected through integral bands (9). In the case of an annular friction component the metal sections (7) are spaced circumferentially around the friction facing (6) and the connecting bands (9) are preferably adjacent the inner periphery (12) of the facing (6).



EP 0 180 389 A3



European Patent
Office

EUROPEAN SEARCH REPORT

0180389

Application number

EP 85 30 7563

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. 4)
Y	US-A-2 812 842 (THELANDER) * figure 3; column 3, line 30 - column 4, line 4 *	1-4, 12 , 14, 15	F 16 D 69/00
Y	GB-A-1 185 175 (TEVES) * page 1, lines 62-75 *	1-4, 12 , 14, 15	
A	EP-A-0 102 147 (AUTOMOTIVE PRODUCTS) * figure 4 *	1, 16	
A	DE-C- 868 540 (HOBBS TRANSMISSION) * figure 2 *	5	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			F 16 D 13/00 F 16 D 69/00
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
BERLIN		15-12-1986	STANDRING M A
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	

EPO Form 1503 03 82

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.